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Consumption Risk Sharing over the Business cycle: the role of Small Firms' Access to Credit Markets

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Abstract

Consumption risk sharing among U.S. federal states increases in booms and decreases in recessions. We find that small firms' access to financial markets plays an important role in explaining this stylized fact: business cycle fluctuations in aggregate risk sharing are more pronounced in states in which small firms account for a large share of output. In addition, better access of small firms to credit markets in the wake of state-level banking deregulation during the 1980s seems to have loosened the dependence of aggregate risk sharing on the business cycle. Not only do our result support that better access to credit markets may have made it easier for the owners of small firms to smooth income in the face of adverse cash-flows shocks to their business. They also suggest an additional welfare benefit from banking deregulation: access to financial markets has become more reliable and is more easily available when households and firms need it most urgently – in economic downturns. A possible implication of these findings is that the welfare costs of a monetary tightening could have been substantially reduced as a result of the financial liberalization at the state level.

Keywords: Interstate risk sharing, regional business cycle, proprietary income, state banking deregulation

JEL classification: E32, E44, F3

1 Introduction

Consumption risk sharing among U.S. federal states increases in booms and decreases in recessions. We find that small firms' access to financial markets plays an important role in explaining this stylized fact: business cycle fluctuations in aggregate risk sharing are more pronounced in states in which small firms account for a large share of output. In addition, better access of small firms to credit markets in the wake of state-level banking deregulation during the 1980s seems to have loosened the dependence of aggregate risk sharing on the business cycle.

Our analysis places itself between two important recent strands of the literature: the first, initiated by Jayaratne and Strahan (1996), explores the implications of state-level banking deregulation on growth, the comovement of regional business cycles (Morgan, Rime and Strahan (2004)) and more recently, risk sharing (Demyanyk, Ostergaard and Sørensen (2007), Acharya, Imbs and Sturgess (2006)).

The second strand emphasizes that the degree to which certain household groups and small firms have access to financial markets is itself subject to dramatic fluctuations over the business cycle. Starting with financial accelerator models in the spirit of Kiyotaki and Moore (1997), a huge literature – both theoretical and empirical, neither of which we attempt to survey here – has emphasized that tightening collateral constraints in credit markets may act as a potentially powerful amplification mechanism for structural shocks, most prominently to monetary policy. Gertler and Gilchrist (1994) were among the first to point at the role of small firms with their strong dependence on bank finance for the monetary transmission mechanism. More recently, Lustig and van Nieuwerburgh (2006) have shown that fluctuations in the availability of mortgage collateral induces business cycle variation in interregional risk sharing whereas Agronin (2003) is among the first to point at the business cycle fluctuations in aggregate risk sharing.

We extend these analyses in several important respects. First, we allow for a range of risk sharing channels which allows us to explore how the entire pattern of risk sharing – income smoothing through capital income flows, fiscal smoothing and – most importantly – intertemporal consumption smoothing through household savings and dissavings varies over the business cycle. This allows us to identify the sources of the procyclical variation in risk sharing: whereas income smoothing (through capital income flows) is strongly anticyclical (as argued by Agronin (2003)), overall, aggregate consumption risk sharing is strongly procyclical because there are strong procyclical fluctuations in the extent to which a region's households can smooth consumption through borrowing and lending.

The access of small businesses to financial markets – in particular to credit – seems key in explaining this dependence of risk sharing on the phase of the business cycle. Risk sharing is more strongly procyclical in federal states where small businesses are particularly important as employers or where the income of small business owners (proprietary or proprietors' income) accounts for a large share of state personal income.

Secondly, we explore the connection to the first strand of the literature surveyed above by controlling for changes in the regulatory environment. Demyanyk, Ostergaard and Sørensen (2007) have shown that there is a strong effect of state level banking deregulation on the *level* of interstate income risk sharing. Our analysis here suggests that the impact of state-level banking deregulation on the *variability* of risk sharing over the cycle is easily equally important: while we corroborate that state level banking deregulation has improved interstate risk sharing through capital income flows, we show that it has also eliminated a large part of the *variability* of consumption risk sharing over the business cycle. Again, small firms seems to have played an important role in this: the procyclical pattern of risk sharing is reduced most strongly for those states where small businesses are particularly important.

From a welfare perspective it not only matters that bank deregulation increases risk sharing on average, but also that it improves risk sharing most when households and firms most urgently need it – in recessions. The results in this paper show that this latter effect of banking deregulation (on the variability of risk sharing) is easily of the same order of magnitude as the effect on its average level: Demyanyk et al. find that risk sharing increases by about 10-18 percentage points as a consequence of banking deregulation. Our results here suggest that each additional percentage point of GDP growth increases aggregate risk sharing by around 3-4 percentage points. The average NBER recession during our sample period reduces aggregate risk sharing by around 17-18 percentage points. The reduction in the variability of risk sharing therefore appears as an important additional source of the aggregate welfare gains from banking deregulation.

At a more general level, our findings have implications for the literature that emphasizes that the costs of aggregate business cycles critically depend on the heterogeneity of households and firms. In particular, they are in line with Gertler and Gilchrist (1994) who show that small firms' output reacts particularly strongly to a tightening of monetary policy. Better access to credit markets may have made it easier for the owners of such small firms to smooth income in the face of adverse cash-flows shocks to their business. But in addition, it has made their access to finance much more reliable by decoupling the availability of credit from the state of the aggregate economy.

This suggests that the welfare costs of monetary tightening could have been substantially reduced as a result of the liberalization of state-level bank branching regulation.

The remainder of the paper is structured as follows: in the next section, we introduce our empirical framework and use it to document the procyclical nature of aggregate risk sharing. We then present our data and the details of the empirical implementation in section three. In section four we discuss our results. Section five concludes.

2 Consumption risk sharing over the business cycle

We measure consumption risk sharing through panel regressions of the form

$$\Delta \log \frac{C_t^k}{C_t^*} = \beta_u \left[\Delta \log \frac{GSP_t^k}{GSP_t^*} \right] + \varepsilon_t^k \tag{1}$$

where C_t^k is per capita consumption in region k in period t, GSP_t^k is the region's output (for U.S. federal states: gross state product) per head and the asterisk denotes the national per capita average of the respective variable. In such a regression, we can think of the estimate of β_u as the amount of uninsured idiosyncratic output risk.

Regressions such as (1) by now have some tradition in the both the microeconometric as well as in the macro literature. Mace (1991), Cochrane (1991) and Townsend (1994) were the first to suggest regressions similar to (1) on household level data as a test of the null of complete markets. In a world with complete markets, growth in marginal utility should be equated across regions, so that in all states of nature:

$$\frac{u'(C_{t+1}^k(s))}{u'(C_t^k(s))} = \mu(s) \tag{2}$$

where s indexes the state of nature. A key implication of (2) is that if risk is efficiently allocated, marginal utility growth should be independent of country-specific variables. To the extent that we can associate changes in marginal utility with consumption growth, consumption growth should therefore be independent of a region's business cycle risks - regressions of the form (1) should yield a coefficient of zero. More recently, Asdrubali, Sørensen and Yosha (1996) have argued that the estimate of β_u may be more generally informative: even if the null of complete financial markets is rejected, β_u still is a measure of market incompleteness. In panel regressions, β_u is regularly between 0 and unity, so that $1 - \beta_u$ can straightforwardly be interpreted as the share of the average region's idiosyncratic risk that gets laid off in financial markets, whereas β_u is the portion of non-diversified idiosyncratic risk faced by the average region.

Estimates of β_u based on regional data typically fall into the range between $0.2 - 0.3$, a quarter to a third of a region's idiosyncratic output risk remains uninsured. Based on our data set here, we obtain an estimate of 0.29. Such estimates are typically based on panel regression such as (1) and they do not allow for the possibility that the amount of risk sharing that a group of regions achieves may actually be varying over the business cycle.

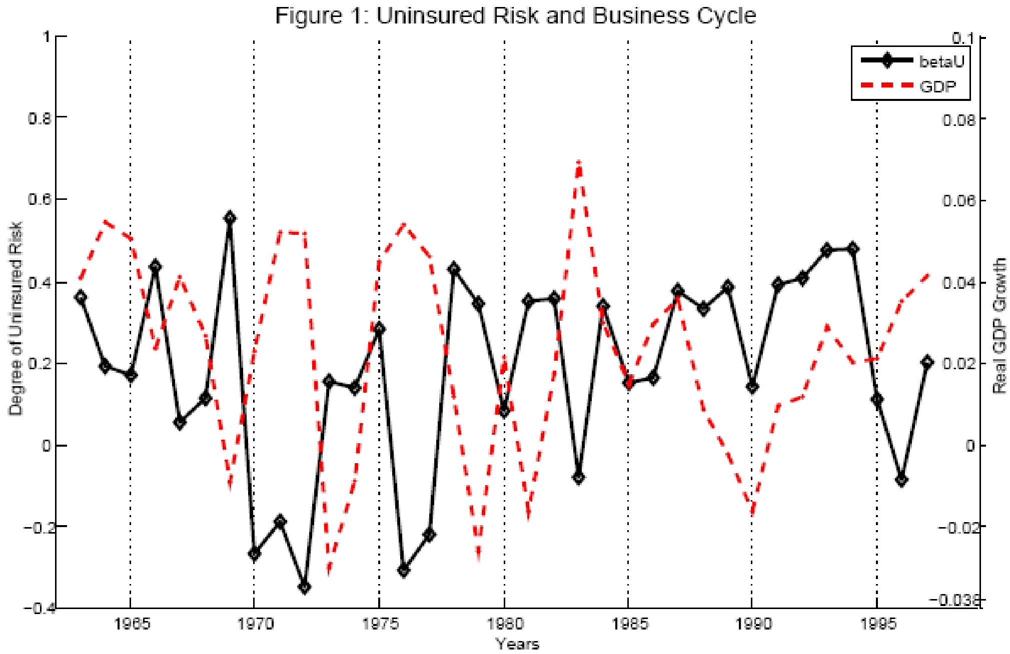
In this paper we argue that aggregate risk sharing varies over the business cycle because certain groups of households may find it harder to obtain consumption insurance in financial markets during recession than during booms. In particular, many small firms heavily rely on access to bank loans, i.e. to credit markets, to smooth fluctuations in business cash flow. It is well documented that credit market frictions tend to hit small firms harder than bigger firms that can issue their own bonds or may even be able to issue equity in stock markets. Gertler and Gilchrist (1994) show that the credit channel of monetary policy has a much stronger impact on small firms than on bigger firms. To the extent that most small firms are non-incorporated, their owners' business and personal finances are likely to be closely intertwined so that fluctuations in business cash flow and in the availability of credit over the business cycle may affect the degree of consumption risk sharing that proprietors of non-incorporated businesses can achieve. In this way, credit market restrictions may translate into fluctuations in aggregate risk sharing across regions.

We present first evidence to this effect in figure 1: the figure plots a sequence of cross-sectional estimates of the coefficient β_u. To obtain this sequence, we run the regression (1) as a cross-sectional regression for each t, where t ranges from 1963 to 1998:

$$\Delta c_t^k - \Delta c_t^* = \beta_u(t) \left[\Delta gsp_t^k - \Delta gsp_t^* \right] + \varepsilon_t^k \tag{3}$$

Here, and in the remainder of the paper, we use lower-case letters to denote logarithms, so that $\Delta c_t^k - \Delta c_t^* = \Delta \log \left[C_t^k / C_t^* \right]$. The solid line in figure (1) represents the sequence $\{\beta_u(t)\}$, the dashed line is real GDP-growth. As is apparent, these two time series comove very closely but in opposite directions; their correlation coefficient is -0.48 – the share of non-diversified state-level idiosyncratic risk increases in recessions and decreases in booms.

As we show in the remainder of the paper, this cyclical pattern in $\beta_u(t)$



is more pronounced in states were small businesses are important. Furthermore, we showt that this cyclical pattern almost vanishes after banking deregulation.

2.1 Patterns of risk sharing

The coefficient β_u in (3) tells us how much of the idiosyncratic risk faced by the average federal state remains uninsured at time t. In order to obtain a better understanding of the nature of the frictions that drive time variation in $\beta_u(t)$, we also want to know *how* this risk sharing is achieved. Building on Asdrubali, Sørensen and Yosha (1996) (ASY) we therefore explicitly consider three channels of interstate risk sharing.

We refer to the first channel as income smoothing: to what extent do net interstate capital and labour income flows help insure income against fluctuations in output? To capture net interstate capital and labour income flows, we look at the wedge between output (gross state product, GSP) and state level personal income (SPI). Note that this wedge may also in part be accounted for by income of legal entities (such as incorporated firms) in so far as this income is not disbursed to households. In this respect SPI differs from the income concept underlying gross national product (GNP) that is used in aggregate, nationwide income accounting. Since GNP data is not available at the state level, it is not possible to disentangle the risk sharing through net interstate factor income flows from the intrastate income smoothing achieved through the balance sheets of legal entities. Small firms - that are our focus here - are often registered as limited liability companies or in other quasi-incorporated forms (such as S-corporations), so that we would expect that this channel of risk sharing could well matter in our findings.

The second channel we consider are net transfers through a progressive tax system through the social security systems all of which may allow residents of a federal state to further smooth disposable relative to state personal income. For brevity, and in line with the extant literature, we call this channel the fiscal channel.

Finally, there may be further consumption smoothing through credit markets at the individual (personal) level, after (disposable) income for the current period is known. This effectively amounts to households smoothing their consumption through savings and dissavings. We therefore refer to this third channel as consumption smoothing.

To gauge the contribution of each of these channels to aggregate risk sharing, we run the following panel regressions:

$$
\begin{aligned}
\Delta\widetilde{gsp}_t^k - \Delta\widetilde{si}_t^k &= \alpha_K + \beta_I \Delta\widetilde{gsp}_t^k + \delta_I^k + \tau_t^I + \varepsilon_{K,t}^k \qquad (4)\\
\Delta\widetilde{si}_t^k - \Delta\widetilde{dsi}_t^k &= \alpha_F + \beta_F \Delta\widetilde{gsp}_t^k + \delta_F^k + \tau_t^F + \varepsilon_{F,t}^k \\
\Delta\widetilde{dsi}_t^k - \Delta\widetilde{c}_t^k &= \alpha_C + \beta_C \Delta\widetilde{gsp}_t^k + \delta_C^k + \tau_t^C + \varepsilon_{C,t}^k \\
\Delta\widetilde{c}_t^k &= \alpha_U + \beta_U \Delta\widetilde{gsp}_t^k + \delta_U^k + \tau_t^U + \varepsilon_{U,t}^k
\end{aligned}
$$

Since all states face aggregate US-wide shocks that cannot be insured by definition, we remove the US-wide aggregate by using the idiosyncratic or state-specific components of all variables that we denote these with a tilde so that $\Delta\widetilde{y}_t^k = \Delta y_t^k - \Delta y_t^{US}$ (for $\Delta\widetilde{y}_t^k = \Delta\widetilde{gsp}_t^k$, $\Delta\widetilde{si}_t^k$, $\Delta\widetilde{dsi}_t^k$, $\Delta\widetilde{c}_t^k$). The coefficients δ_X^k capture state-specific fixed effects. Finally, to control for any remaining common time-variation in the intercept that may not already be captured by formulating all regressions in terms of idiosyncratic variables, we also include a set of the time-specific common effects τ_t^X.

Note that $\beta_I + \beta_F + \beta_C = 1 - \beta_U$ by construction, so that the above regressions provide us with a complete decomposition of the cross-sectional variance of state-specific output growth. In this way we obtain not only a picture of how much risk is shared $(1 - \beta_U)$, but we also get a breakdown into the contribution of the different channels to aggregate risk sharing (the coefficients β_K, β_F and β_C).We call the vector $\boldsymbol{\beta} = [\boldsymbol{\beta}_I, \boldsymbol{\beta}_F, \boldsymbol{\beta}_C, \boldsymbol{\beta}_U]$ the pattern of risk sharing.

3 Empirical implementation

3.1 Data

We use a panel of variables for the 51 U.S. states for the period 1963-1998. To measure regional risk sharing on each level we employ the updated data set constructed by ASY. These data consist of annual gross state product and personal income data from the Bureau of Economic Analysis (BEA). Disposable state income is constructed as state income plus federal transfers, minus total federal taxes raised in the state. State consumption consists of state/local government and private consumption. Since private consumption at the state level is not available, state private consumption is estimated as the state retail sales data re-scaled by the ratio of total private consumption to total US retail sales. Real gross domestic product is the sum of gross state products over all 51 states. All these variables are in per capita terms and deflated by the price index for personal consumption expenditure. Growth rates of real per capita variables are calculated as first differences of natural log of per capita deflated level values. Further details on all data and their preparation are provided in the appendix.

We consider two measures of the importance of small businesses in a federal state. The first is the share of (non-farm) proprietors' income in state personal income. This measure of proprietors' income or proprietary income is readily obtained from the National Income and Product Account (NIPA)-tables and is available from the the Bureau of Economic Analysis (BEA). The second measure is the share of small business employment in total state employment. This measure defines establishments as 'small' if they have less than 100 employees. The data is available from the Geospatial and Statistical Data Center at the University of Virginia library.

While the first measure focuses more narrowly on the role of those households that actually own small businesses, the second is a broader measure in that it focuses on the role of small businesses for the local economy at large. As we show, our results throughout are very similar for the two measures.

We measure the direct effect of deregulation using a dummy variable which becomes one from the year in which both interstate and intrastate deregulation were completed. Deregulation dates are from Demyanyk et al. (2007).

NBER recession and expansion dates are from NBER Business Cycle Dates.

3.2 Empirical setup

To explore business cycle fluctuation in the pattern of risk sharing as well as its variation across federal states, we parametrize $\boldsymbol{\beta}$ as a function of aggregate variables. In addition, we control for (potentially time-varying) regional characteristics. Again, collecting $\boldsymbol{\beta}^k(t) = [\boldsymbol{\beta}_K^k(t), \boldsymbol{\beta}_F^k(t), \boldsymbol{\beta}_C^k(t), \boldsymbol{\beta}_U^k(t)]$, we parametrize

$$\beta_X^k(t) = \beta_{X0} + \mathbf{z}_t^{k\prime}\boldsymbol{\beta}_{X1} \tag{5}$$

for $X = K; F; C, U$. Here, β_{X0} measures the average amount of risk insured via income, fiscal, and consumption smoothing and uninsured risk respectively when $\mathbf{z}_t^k$ equals zero. $\boldsymbol{\beta}_{X1}$ exhibits the change in each level of risk sharing associated with shifts in $\mathbf{z}_t^k$. We partition $\mathbf{z}_t^k$ into aggregate and regional characteristics $\mathbf{z}_t^{k\prime} = \left[\mathbf{x}_t', \mathbf{y}_t'^k\right]$.

By plugging (5) into the panel sharing regressions (**??**) above and multiplying out, we then obtain a set of interaction terms with $\Delta\widetilde{gsp}_t^k$. The coefficients on these interaction terms then correspond to the respective coefficients in the vector $\boldsymbol{\beta}_{X1}$ and allow us to calculate $\beta_U^k(t)$ given the aggregate and state specific characteristics at time t.

Again, in all our regressions, we control for region-specific fixed and aggregate time effects.

Note that the interaction term regressions that ensue from this specification for $\beta^k_X(t)$ we will not generally need to include the uninteracted terms $\mathbf{z}^k_t$. The reason for this is that the time-variation in aggregate variables will be captured through the panel time-specific effects. Equally, as long as the regional characteristics are assumed to be time-invariant (which we will do in the majority of cases – e.g. the economic weight of small businesses does generally not vary much over time), these will be fully captured by the regional fixed-effects. Hence, the regressions we estimate will generally be of the form

$$x_t = \beta_{X0}\Delta\widetilde{gsp}^k_t + \mathbf{z}^{k\prime}_t\boldsymbol{\beta}_{X1}\Delta\widetilde{gsp}^k_t + \alpha_X + \delta^k_X + \tau^X_t + \varepsilon^k_{X,t}$$

with $x_t = \Delta\widetilde{gsp}^k_t - \Delta\widetilde{si}^k_t$, $\Delta\widetilde{si}^k_t - \Delta\widetilde{dsi}^k_t$, $\Delta\widetilde{dsi}^k_t - \Delta\widetilde{c}^k_t$, $\Delta\widetilde{c}^k_t$ for $X = I, F, C, U$ respectively.

4 Results

Our first set of results is presented in table 1. Here we run the decomposition (4) above by parametrizing

$$\beta_X(t) = \beta_{0X} + \beta_{1X}\Delta gdp_t \tag{6}$$

where Δgdp_t is aggregate GDP growth. Confirming the intuition provided in figure (1), we find that consumption risk sharing increases in booms and decreases in recessions (i.e. $\beta_U(t)$ is countercyclical). Interestingly, the income and consumption smoothing channels have opposite cyclical dependence on GDP; whereas income smoothing through capital markets decreases in booms and increases in recessions, the opposite is true for consumption smoothing in credit markets. Consumption smoothing decreases in recessions, whereas it improves in booms. This latter effect dominates the positive effect of recessions on income smoothing (and is further reinforced through the fiscal channel) so that the total extent of risk sharing, as measured by $1 - \beta_U(t)$, is strongly procyclical.

These results are robust to the inclusion of alternative measures of the business cycle. In panel B, we capture the business cycle using the official NBER recession and expansion dates. We also distinguish between recessions and booms to check for the possibility of asymmetries in the dependence of risk sharing on the cycle. There is no sign of such asymmetries: the coefficients on the expansion and recession indicators are virtually of the same order of magnitude and all correctly signed throughout and – with the sole but only marginal exception of the expansion indicator in the regression for β_U – also highly significant.[1]

[TABLE 1 about here]

One of the main claims of our paper is that risk sharing fluctuates over the business cycle because small firms' access to financial markets varies over time. Specifically, small firms heavily rely on bank finance. Non-incorporated firms, by definition, cannot raise capital in stock markets. In addition, small businesses' finance and the personal consumption decisions

[1]Though estimated β_U - coefficients indicate that reduction of aggregate risk sharing in recessions is stonger than rise in booms, we can not reject the hypothesis $\beta_{1U} + \beta_{2U} = 0$. Hence, we suppose that there is no asymmetries between expansions and recessions and do not explore this issue further

of their owners tend to be closely intertwined. A tightening of credit market conditions is therefore particularly likely to affect the ability of small business owners to smooth consumption over time. To the extent that credit market access by small businesses is an important determinant of the variation of aggregate risk sharing over the business cycle, our expectation would be that it is the fluctuation in the contribution of the credit market channel of risk sharing that is the main driver of this comovement. This is what we find here: our estimate of $\beta_C(t)$ is strongly procyclical and highly significant.

Interestingly, income risk sharing decreases in booms and rises in recessions. This pattern has also been observed by Agronin (2003). The most likely reason for this is that the share of small business owners' income (proprietary income) in U.S. output is generally strongly procyclical. Since, by definition, proprietary income cannot be interregionally disbursed through dividend payments, the share of capital income available for interstate income smoothing decreases. We confirm this conjecture below.

However, our results here, lead to conclusions that are otherwise diametrically exposed to Agronin's since we also take account of the consumption smoothing channel: the extent to which states use credit markets as a way to obtain consumption smoothing is much more procyclical than the income smoothing channel is anticyclical. Hence, fluctuations in access to consumption smoothing possibilities in credit markets is the main driver of the variation in aggregate risk sharing over the business cycle.

We show next that the cyclical pattern of risk sharing that we established in table 1 is indeed much more pronounced when proprietary income accounts for a large portion of aggregate income in the economy. First, in panel A of table 2, we split our sample of states into three equally.sized goups according to wheter the importance of small businesses is high, middle or low.[2] We then rerun the regression specification **(x)** for the unsmoothed component , $\beta_U(t)$, on each of these groups. As is apparent, the coefficient on the interaction term between aggregate GDP, Δgdp, and per capita gross state level product growth, is highly significantly negative for those states where small businesses are important. For the other two groups of states, aggregate risk sharing does not seem to covary strongly with the business cycle. The results are qualitatively the same, irrespective of whether we use the income or the employment based measure of small business importance.

[Table 2 about here]

Secondly, we estimate a specification for $\beta_X(t)$ in which the sensitivity to the aggregate business cycle is a direct function of small business importance. To this end, we include an interaction term between Δgdp_t and μ^k, where μ^k stands for either the share of proprietary income in personal income ($shapi^k$) or for small business employment (SBE^k). Our specificiation for $\beta_X(t)$ then becomes:

$$\beta_X(t) = \beta_{X0} + \beta_{X1}\Delta gdp_t + \beta_{X2}\Delta gdp_t\mu^k$$

Panel B of table 2 presents the results both for the non-shared component of idiosyncratic risk, $\beta_U(t)$, as well as for the three risk sharing channels, $X = I, F, C$. For both measures, our previous results are confirmed: the cyclical dependence is more pronounced where small firms are important. Turning to the patterns of risk sharing, we see that this feature can be explained by the fact that the consumption smoothing channel is particularly procyclical in states where small businesses are important.

[2] These groups are provided in table A1 in the appendix.

Note also that the coefficient β_{U1},i.e. the one on Δgdp, now becomes insignificant, suggesting that cross-sectional variation in the importance of small businesses for the local economy seems to be able to completely account for the dependence of aggregate risk sharing on the state of the business cycle.

All this suggest that small firms play an important role in explaining why aggregate risk sharing fluctuates over the business cycle. It is, however, conceivable, that the time variation in these firms' access to finance is not mainly the result of them being rather small, but rather the the outcome of these firms being concentrated in particular sectors of the economy.

We address this issue in table 3, where we repeat our regressions for $\beta_U(t)$, but now we also include a number of controls. Specifically, we capture industrial structure through a sectoral specialization index of the form

$$SPEC_k = \sum_{s=1}^{S} \left\{ \frac{GSP_k^s}{GSP_k} - \frac{1}{K-1} \sum_{j=1, j \neq k}^{K} \frac{GSP_j^s}{GSP_j} \right\}^2$$

where GSP_k^s / GSP_k is the share of value added in sector s in the total value added of state k. In our regressions, we use the estimates of $SPEC_k$ provided in table (1) of Kalemli-Ozcan, Sorensen and Yosha (2001) for both the one and the two digit industry classification levels. In our specification for $\beta_u(t)$ we then also include both $SPEC$ and its interaction with Δgdp. In some of the regression reported in table 3, we also include a linear trend to account for the possibility that the degree of aggregate risk sharing may have changed over our sample period due to othe unobserved factors.

[Table 3 about here]

The results clearly show that industrial structure matters both for the degree of interregional risk sharing as well as for its cyclical dependence. More specialized regions tend to be better insured, a stylized fact first established by Kalemli-Ozcan, Sorensen and Yosha (2001, 2003). It is also appears to be the case that more specialized regions tend to be exposed more to cyclical variation in risk sharing, even though this result appears less pronounced in the weighted least squares regressions. Controlling for industrial structure does, however, not affect our findings that small businesses are paramount in explaining why aggregate risk sharing fluctuates over the cycle. We therefore conclude that it is not mainly industrial structure but the incidence of small firms that can account for the patterns we have documented above.

4.1 The role of banking deregulation

Our maintained hypothesis is that small firms' access to credit markets, particularly to bank loans, is a key determinant of risk sharing. A nascent but growing literature argues that regulatory changes in banking markets that occurred in the United States during the 1980s may have had a profound impact on small firm's access to credit. Specifically,during the 1980s, most federal states gradually abolished regulation, previously enacted in the aftermath of the great depression, that restricted the formation of larger banks by forbidding banks or their holding companies to operate outside their state (sometimes even their county) of origin. Following the Douglas Amendment to the 1956 Bank Holding Company Act, most federal states gradually abolished these restrictions which led to a huge consolidation in the banking sector and a better interstate pooling of credit risk. From the point of view of economic theory, one would expect that better interstate pooling of such risk could lead to substantial welfare gains. Indeed, Jayaratne and Strahan

(1996) show that federal states that deregulated their banking markets earlier did eventually grow faster. They ascribe much of this growth gain to better access of small firms' to credit. In a recent important contribution, Demyanyk et al. demonstrate that income risk sharing increased due to state-level banking deregulation and they also show that this increase was more pronounced in states where there are lots of small businesses. While our paper is closely related to Demyanyk et al.'s,our analysis differs in scope in that we focus on the role of proprietary businesses and state-level banking deregulation for business cycle *variability* in risk sharing rather than on the effect of deregulation on the *level* of risk sharing.

In most states, deregulation proceeded in two waves: in most cases, branching and ownership restrictions within the state were abolished first (intra-state deregulation) whereas the formation of larger banks or bank holding companies across states as well as interstate mergers were allowed only later (interstate deregulation). Our maintained hypothesis is that small firms' local access to finance is a precondition for them to benefit from any form of banking deregulation: if a small firm cannot borrow from out-of county banks (e.g. due to an ineffcient and fragmented banking system) it will not be able to benefit from what may be a better interstate pooling of bank funds (which may be one of the benfits of interstate deregulation). This is also the gist of the results in Demyanik et al. who report that the gains from deregulation – in as far as they concern small businesses – are mainly associated with intra-state liberalization. We discuss the importance of the distinction between intra- and interstate deregulation in more detail the next subsection but unless oterhwise mentioned, we focus on intra-state deregulation.

To capture deregulation empirically, we use a set of dummies SDD_t^k that are unity after that point in time at which a state k has abolished intra-state bank branching and ownership restrictions.

In table 4, we explore if intra-state banking deregulation has had an impact on the the pattern of risk sharing and the degree to which it varies over the business cycle. In panel A, we first introduce the dummy SDD_t^k to allow for a state-specific impact on the *level* of risk sharing. Doing so leaves our conclusions with respect to the cyclical fluctuation in the pattern of risk sharing unaffected; the point estimates for all channels as well as for the unsmoothed component remain virtually unchanged and highly significant.

[Table 4 about here]

Quite in line with Demyanyk et al., we find a sizeable positive level effect of banking deregulation on the level of income smoothing through capital markets: deregulation leads to roundabout 20% more risk sharing through the capital market. Interestingly, however, we also find that deregulation lowers the amount of consumption smoothing by roughly the same, so that the net effect of banking deregulation on β_u appears insignificant. This would seem to suggest that banking deregulation has had a pronounced effect on the patterns of income and consumption smoothing but less so on the total amount of risk shared.[3]

Our argument here is that banking deregulation could have had an economically at least equally important effect by weakening the variability of

[3] It is beyond the scope of this paper to explore the reasons for this shift in the pattern of risk sharing. One possible explanation could be provided by the creation of the S-corporation in the early 1980s. The S-corporation, though being a legal entity, is tax exempt. Only profits disbursed to shareholders are taxed as personal income (statistically they are then registered as proprietary income). In a progressive tax system, this could create a tax incentive to smooth the disbursement of profits, provided the firm can buffer fluctuations in cash flow through access to credit markets. Clearly, we would expect the latter to have becom easier in the wake of deregulation.

aggregate risk sharing, mainly by making small firms' access to credit less dependent on the state of the business cycle.

Table 4, panel B shows the impact of banking deregulation on the *cyclical* pattern of risk sharing:

$$\beta_X^k(t) = \beta_{X0} + \beta_{X1}\Delta gdp_t + \beta_{X2}\Delta gdp_t SDD_t^k \tag{7}$$

For both the income and the consumption smoothing, the coefficients β_1 and β_2 have opposite sign and are highly significant. In both cases, we accept the hypothesis $\beta_1 + \beta_2 = 0$ at very high significance levels. This carries over to $\beta_u(t)$ as well. Here again, we cannot reject $\beta_{U1} + \beta_{U2} = 0$. These findings suggest that banking deregulation has eliminated almost all of the business-cycle dependence of aggregate risk sharing.

Small businesses are, again, key in this finding. In table 5, we interact Δgdp with the share of proprietary income and one minus the state-level deregulation dummy, i.e. we parametrize

$$\beta_X(t) = \beta_{X0} + \beta_{X1}\Delta gdp_t + \beta_{X2}\Delta gdp_t \mu^k(1 - SDD_t^k) + \beta_{X3}SDD_t^k \tag{8}$$

Quite in line with our findings in table 2, we find that risk sharing is much more strongly dependent on the business cycle in those states and in those times when proprietary income is high. Again, this is true, irrespective of whether we use small business employment ($\mu^k = SBE^k$) or the share of proprietary income ($\mu^k = shapi^k$). The interaction with $1 - SDD_t^k$ ensures that the effect on risk sharing variability is 'switched off' after state regulation. Now, the coefficient on the stand-alone Δgdp-term, β_1 , appears insignificant in all channels and also for β_U. This suggests that the business-cycle dependence of risk sharing is not only explained well by the interaction between the share of small businesses and aggregate GDP; it seems in line with the data that the dependence on aggregate GDP has been substantially diminished as a consequence of banking deregulation.

4.2 Intra- vs. interstate banking deregulation

So far the measure of deregulation we used in our analysis was the date of intra-state deregulation of banking services in a given state. Here, we examine to what extent intra- or interstate deregulation has shifted the patterns of risk sharing and, in particular, to what extent one of the two forms of deregulation has changed the variability of risk sharing over the cycle.

Table 6 displays results for each deregulation measure separately and for both measures together including both level and business-cycle effects on risk sharing. It is apparent that whilst interstate deregulation has mainly affected the average level of income and consumption smoothing, only intrastate deregulation has had a significant impact on the variability of risk sharing. Again, this is true for all individual channels as it is for aggregate risk sharing, $1 - \beta_U(t)$. We think that this result has a highly intuitive interpretation: We should expect that, on average, improvements in interstate risk sharing are mainly brought about by a better pooling of credit risk across states. Allowing the formation of banks that operate across state borders was a key feature of *interstate* deregulation. *Intrastate* deregulation, on the other hand, has permitted bank branching and the opening of new banks within states. This is likely to have facilitated access of certain household groups and in particular of small firms to credit markets within the state, thus reducing the variability of credit market access over the business cycle. But we should not expect intrastate regulation to hugely help improve risk sharing with other states on average.[4]Our results in this respect clearly tie in with the findings of Jayaratne and Strahan and Demyanik et al. who also ascribe the importance of deregulation for small businesses rather to the intra-state than the inter-state dimension.

4.3 Extensions and robustness

4.3.1 Heteroskedasticity

We also examine whether our results are similar when we use weighted LS, rather than OLS, estimation - OLS estimation, being unweighted, is likely to give larger weight to smaller states. Column I in table 8 shows that our main result, that aggregate risk sharing positively depends on business cycle, still holds.

4.3.2 Risk sharing, asset prices and collateral constraints

As final exercise we examine to what extent our results are affected by allowing aggregate risk sharing to vary with asset prices. There are two channels through which asset prices could account for risk sharing fluctuations. First, asset prices fluctuations affect the value of collateral and may therefore have an impact on credit market access. Secondly, asset price fluctuations, in particular of stock prices, could affect risk sharing over the cycle because they directly change the degree of interregional portfolio diversification: Household holdings of domestic stocks represent a claim to output in other federal states so that stock ownership brings interregional diversification.[5] When stock prices rise, the value of this diversified component

[4]If it improves risk sharing, then the extent of this improvement is rather very small or insignificant.

[5]This is certainly true if a household holds a diversfied claim on an entire tsock portfolio. But it is also likely to be the case if the houeshold holds only a limited number of stock of companies. Provided these companies are sufficiently big, their stock represent claims

of wealth increases relative to that of non-diversifiable components, such as labour income, housing or proprietary wealth. Therefore, interregional risk sharing is likely to fluctuate with stock market valuations.

To assess to what extent our results interact with time variation in collateral values, we turn to the recent study by Lustig and van Nieuwerburgh (2006) who have argued that the availability of housing collateral constrains interstate risk sharing in the U.S. Possibly, the availability of housing collateral could help explain why risk sharing fluctuates over the business cycle. In addition, given that small businesses face high non-insurable risk and may therefore face particularly severe credit constraints, the availability of housing collateral may be especially important for small business owners for whom personal and business finance are closely intertwined. To explore this nexus, we parametrize

$$\beta = \beta_0 + \beta_1 \Delta gdp + \beta_2 my_t \cdot \mu^k + \beta_3 my_t + \beta_5 (t - \bar{t}) \tag{9}$$

where my_t is Lustig and van Nieuwerburgh's indicator of housing collateral scarcity.[6] Table 7 reveals that business cycle dependence of risk sharing at each level of smoothing remains highly significant. At the same time, however, scarce housing collateral entails a drop in income smoothing. Hence, housing collateral scarcity clearly matters for risk sharing, but it cannot explain the dependence of interstate risk sharing on aggregate GDP growth. Interestingly, the effect of collateral scarcity on risk sharing is amplified in states with a high share of proprietary income. Note also that once we consider the interaction of proprietorship with housing collateral scarcity,

to their profits from many different federal states.

[6] Housing collateral scarcity is rescaled housing collateral ratio, that is measured as deviation from the cointegration relationship of households real estate wealth and labor income plus transfers. Further details of estimation are in data appendix.

the aggregate housing collateral factor alone ceases to have a significant impact on aggregate risk sharing: if a state exhibited a zero share of proprietary income out of personal income, aggregate risk sharing would appear to be independent of housing collateral. These results, again, suggest that small firms' access to credit seems to be crucial in understanding why risk sharing fluctuates over the business cycle. But the fact that the cyclical dependence of risk sharing holds up even once we control for Lustig and van Niewerburgh's collateral scarcity measure, also suggests that housing collateral constraints may only be a part of our story.

Table 8 explores the impact of asset prices – in particular of stock market valuations – on interregional diversification. To this end, we include a measure of asset price cycles as an additional interaction term in our regressions. We use Lettau's and Ludvigson's (2001) *cay* -residual, an econometric proxy of the consumption-wealth ratio that, as Lettau and Ludvigson have shown, is a very good indicator of the cyclical component in U.S. stock markets. As is apparent from columns II-IV of table 8, *cay* indeed contains useful additional information, that helps explain fluctuations in aggregate risk sharing: risk sharing significantly increases when asset prices are high (*cay* is low) and decreases, when asset prices are low (*cay* is high). But note that the inclusion of *cay* does not change our results with respect to the variation of risk sharing as a function of aggregate GDP.

5 Conclusions

In this paper we establish that interstate risk sharing in the United States varies over the business cycle, with risk sharing increasing in booms and decreasing during downturns. This variation in aggregate risk sharing is quantitatively important. Over our sample period, the average state would share 79 percent of its business cycle risk. But every percentage point increase in GDP growth increases risk sharing by almost four percentage points and in the trough of the average recession in our sample period, risk sharing was 17% percentage points below this level.

There is also a distinct pattern in how risk is shared over the business cycle. Interestingly, we find that income smoothing through capital income flows is hugely countercyclical, whereas consumption smoothing through savings and dissavings at the household level is strongly procyclical. It is the latter effect that dominates, so that aggregate risk sharing is also strongly procyclical.

We argue that these patterns of risk sharing are determined by time-variation in the ability of small firms to obtain credit. First, we demonstrate that the business cycle dependence of risk sharing is much more pronounced in states where small firms are particularly prevalent, either because proprietary income constitutes a higher fraction of personal income or because small business employment is high. Secondly, we show that the deregulation of state-level bank branching and holding legislation in the U.S. has hugely affected this pattern: banking deregulation virtually removes the dependence of aggregate risk sharing on the business cycle and, again, this reduction in cyclical dependence is strongest in states where small businesses are important.

At a theoretical level, banking deregulation may affect risk sharing in two ways: better interstate pooling of credit risk may lead to more risk sharing on average. Secondly, in models with collateral and borrowing constraints, consumption risk sharing may be sensitive to the phase of the business cycle. While we corroborate and extend recent findings by Demyanyk et al. (2007) concerning the first effect by showing that banking deregulation has altered the long-term, average pattern of risk sharing by increasing income risk sharing at the household level, we find the second effect quantitatively at least equally important: banking deregulation has increased risk sharing particularly in business cycle downturns, thus improving credit market access for small firms most when it is also most needed.

Interestingly, we find that the first of the two effects – the long-term level effect on risk sharing – to be associated with interstate deregulation, whereas the reduction in the cyclical dependence of risk sharing is linked mainly to intrastate deregulation.

6 Data appendix

Gross State Product (gsp). Gross State Product is defined as the "value added" of the industries of a state. Data for gross state product are available from the BEA. GSP (as all our data) is divided by state-by-state population.

State Income (si). State income is defined as the sum of earnings (wages and proprietors' income), distributed profits (including interest and rent) of residents of the state and state and federal non-personal taxes (including corporate taxes and indirect business taxes). State income is constructed by ASY of the single components that are available from the BEA.

Disposable State Income (dsi). Disposable income is defined as state income plus federal transfers to individuals and federal grants to state governments minus federal non-personal taxes and contributions and federal personal taxes. Federal grants are provided by the United States Statistical Abstract, federal personal taxes and transfers are available by state from the BEA.

State Consumption (c). State consumption is defined as the sum of private consumption and consumption by the state government. Private consumption at the state level is not available. ASY constructed private consumption as retail sales re-scaled by the ratio of aggregate US private consumption to aggregate US retail sales.

Share of Proprietary Income (shapi). We calculate the share of proprietary income as the ratio of state proprietary income to state personal income. The both data for personal and proprietary income are from the BEA. Proprietary income is defined by the BEA as current-production income of sole proprietorships, partnerships, and tax-exempt cooperatives. It excludes dividends, monetary interest received by nonfinancial business, and rental income received by persons not primarily engaged in the real estate business. A sole proprietorship is an unincorporated business owned by a person; a partnership is an unincorporated business association of two or more partners; a tax-exempt cooperative is a non-profit business organization that is collectively owned by its customer-members[7].

Small Business Employment (SBE). Small businesses are establishments with a number of employees less than 100. We measure small business employment as number of people employed in small business establishments relative to total employment. Since available data are from 1977 to 1997, we use idiosyncratic time-series averages for every state k, so that $SBE^k = mean(SBE_t^k - \overline{SBE}_t)$, where $\overline{SBE}_t$ is cross-sectional mean for

[7] The national estimates of the income of non-farm proprietorships are based on tabulations of Internal Revenue Service (IRS) tax returns. According to tax law IRS does not distinguish between general partnerships, limited partnerships and limited liability companies and, hence, owners of partnerships and LLCs report their business income or losses on their individual tax returns. That is why proprietary income does include income from LLCs .

every time period t. The data is available from Geospatial and Statistical Data Center, University of Virginia library.

Gross Domestic Product (gdp). Gross domestic product is constructed as sum of gross states products (not per capita) over all states for every time period t divided by total US population.

NBER Indicators. The data are from NBER Business Cycle Dates (http://www.nber.org/cycles.html). NBERPeak dummy equals one, when business cycle reaches peak, otherwise it is zero. NBERTrough dummy equals one, when business cycle reaches it's trough, otherwise it is zero. NBERExpansion becomes one from trough to peak, including peak, from peak to trough it is zero.

Deregulation (SDD). We use data on banking deregulation from Demyanyk et al. (2007), Table 1. Deregulation dummy becomes one from the year where both interstate and intrastate deregulation took place. We measure the effect of intrastate branching deregulation using dummy variable $D^{intra}_{k,t}$, which switch on (from 0 to 1) the year state k permitted statewide branching by merges and acquisitions and stays on thereafter. The interstate deregulation indicator $D^{inter}_{k,t}$ switches on the year state k permits entry by out-of-state banks and stays on thereafter.

Housing Collateral Ratio (my). We follow Lustig and van Nieuwerburgh (2005, 2006) and estimate housing collateral ratio my_t as the deviation from the cointegrating relationship $my_t = \log(h_t) + \widehat{\varpi}\log(y_t) + \widehat{\upsilon}t + \widehat{\chi}$, where h_t is housing wealth measured by real estate wealth, y_t is labor income plus transfers, t is time trend, and $\widehat{\chi}$ is a constant. Then we remove a constant and a trend, so that the resulting time series my_t are mean zero and stationary, according to an ADF test. The housing collateral ratio is rescaled so that it lies between 0 and 1 and measures collateral scarcity: $mys_t = \frac{my^{\max} - my_t}{my^{\max} - my^{\min}}$, where $my^{\max}$ and $my^{\min}$ are the maximum and minimum observation in the respective samples.

Consumption-Wealth Ratio (cay_t). The data are freely available at Martin Lettau's home page (http://pages.stern.nyu.edu/~mlettau/).

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Table 1: Risk Sharing and the Business Cycle.

Table reports results from the panel OLS regressions

$$\widetilde{gsp}_{k,t} - \widetilde{inc}_{k,t} = \alpha^I + \beta_I \widetilde{gsp}_{k,t} + \tau_t^I + \theta_k^I + \epsilon_{k,t}^I,$$
$$\widetilde{inc}_{k,t} - \widetilde{dinc}_{k,t} = \alpha^F + \beta_F \widetilde{gsp}_{k,t} + \tau_t^F + \theta_k^F + \epsilon_{k,t}^F,$$
$$\widetilde{dinc}_{k,t} - \widetilde{c}_{k,t} = \alpha^C + \beta_C \widetilde{gsp}_{k,t} + \tau_t^C + \theta_k^C + \epsilon_{k,t}^C,$$
$$\widetilde{c}_{k,t} = \alpha^U + \beta_U \widetilde{gsp}_{k,t} + \tau_t^U + \theta_k^U + \epsilon_{k,t}^U.$$

$\widetilde{gsp}_{k,t}$, $\widetilde{inc}_{k,t}$, $\widetilde{dinc}_{k,t}$, and $\widetilde{c}_{k,t}$ are defined in the text. $\beta_{\cdot}$ are defined as follows. $\cdot$ stays for I, F, C, U. $\alpha^{\cdot}$ are not reported. The data is annual from 1963 to 1998. T-statistics are in parenthesis. Significance at the 10% level is denoted by a *, and at the 5% level by **.

	(I)	(F)	(C)	(U)
Panel A: $\beta_{\cdot}(t) = \beta_{0\cdot} + \beta_{1\cdot}\Delta gdp_t + \beta_{2\cdot}(t - \bar{t})$				
$\beta_{0\cdot}$	0.5819**	0.0308**	0.1708**	0.2164**
	(48.8202)	(3.0092)	(5.6348)	(7.6987)
$\beta_{1\cdot}$	-3.1640**	1.0643**	6.2182**	-4.1185**
	(-8.1399)	(3.1891)	(6.2900)	(-4.4926)
$\beta_{2\cdot}$	0.0170**	-0.0017	-0.0235**	0.0082**
	(12.1962)	(-1.4183)	(-6.6138)	(2.4773)
Panel B: $\beta_{\cdot}(t) = \beta_{0\cdot} + \beta_{1\cdot}NBERpeak_t + \beta_{2\cdot}NBERtrough_t + \beta_{3\cdot}(t - \bar{t})$				
$\beta_{0\cdot}$	0.5236**	0.0795**	0.2563**	0.1407**
	(39.5847)	(7.1518)	(7.6962)	(4.5686)
$\beta_{1\cdot}$	-0.0147	-0.1106**	0.2160**	-0.0907
	(-0.5730)	(-5.1164)	(3.3353)	(-1.5141)
$\beta_{2\cdot}$	0.0779**	-0.0324*	-0.2244**	0.1789**
	(2.9498)	(-1.4609)	(-3.3738)	(2.9080)
$\beta_{3\cdot}$	0.0178**	-0.0030*	-0.0237**	0.0089**
	(12.3437)	(-2.4886)	(-6.5350)	(2.6622)

Table 2: Risk Sharing and Small Businesses

Panel A reports the results of panel regressions according to (4) in the text. $\beta_{\cdot}$ is defined as $\beta_{\cdot} = \beta_{0\cdot} + \beta_{1\cdot}\Delta gdp_t + \beta_{2\cdot}\Delta gdp\mu_k$. $\cdot$ stays for I, F, C, U. μ_k denotes time-series means of the share of proprietary income or small business employment for every state k and is defined respectively as $\mu_k^1 = \frac{1}{T}\sum_{t=1964}^{1998}(Shapi_{t,k})$ and $\mu_k^2 = \frac{1}{T}\sum_{t=1973}^{1998}(SBE_{t,k})$.
Panel B reports results from the panel OLS regression $\widetilde{c}_{k,t} = \alpha^U + \beta_U \widetilde{gsp}_{k,t} + \tau_t + \theta^k + \epsilon_{k,t}^U$. β_U is defined as $\beta_U = \beta_{0U} + \beta_{1U}\Delta gdp_t$. The states are splitted according to the measure of small business importance ("low", "middle", "high") μ^k. μ^k is defined as before. $\alpha^{\cdot}$ are not reported.The data is annual from 1963 to 1998. T-statistics are in parenthesis. Significance at the 10% level is denoted by a *, and at the 5% level by **.

	(I)	(F)	(C)	(U)
		Panel A		
$\beta_{\cdot} = \beta_{0\cdot} + \beta_{1\cdot}\Delta gdp_t + \beta_{2\cdot}\Delta gdp\mu_k^1$				
$\beta_{0\cdot}$	0.5925**	0.0304**	0.1506**	0.2264**
	(49.4285)	(2.9600)	(4.9911)	(8.0562)
$\beta_{1\cdot}$	6.8483**	0.6292	-12.2464**	4.7689**
	(7.2659)	(0.7788)	(-5.1627)	(2.1579)
$\beta_{2\cdot}$	-87.1189**	3.8735	159.9360**	-76.6907**
	(-11.8772)	(0.6160)	(8.6638)	(-4.4592)
$\beta_{\cdot} = \beta_{0\cdot} + \beta_{1\cdot}\Delta gdp_t + \beta_{2\cdot}\Delta gdp\mu_k^2$				
$\beta_{0\cdot}$	0.5796**	0.0312**	0.1744**	0.2149**
	(46.8685)	(3.0477)	(5.6916)	(7.6360)
$\beta_{1\cdot}$	6.7570**	-2.2970	-11.2474	6.7874
	(2.3284)	(-0.9563)	(-1.5644)	(1.0278)
$\beta_{2\cdot}$	-15.6308**	5.2279	27.4094**	-17.0065
	(-3.5158)	(1.4208)	(2.4885)	(-1.6810)

	low μ_k	middle μ_k	high μ_k
	Panel B		
$\mu_k = \mu_k^1$			
β_{0U}	0.3519**	0.1918**	0.2090**
	(5.1772)	(5.7192)	(3.5257)
β_{1U}	-3.5808	-1.0718	-7.4563**
	(-1.6030)	(-0.8588)	(-4.4388)
$\mu_k = \mu_k^2$			
β_{0U}	0.3678**	0.2373**	0.1804**
	(5.4217)	(3.7876)	(4.5150)
β_{1U}	-2.8655	-3.7095*	-4.7409**
	(-1.3566)	(-1.7027)	(-3.6419)

Table 3: Risk Sharing, Proprietary Income and Industrial Specialization

Table reports results from the panel WLS/OLS regressions $\widetilde{c}_{k,t} = \alpha^U + \beta_U \widetilde{gsp}_{k,t} + \epsilon^U_{k,t}$. $gsp_{k,t}$ is the growth rate of gross state product in state k in period t and $\widetilde{gsp}_{k,t}$is $gsp_{k,t}$ minus US-wide value of $gspUS_t.c_{k,t}$ and $\widetilde{c}_{k,t}$ are defined similarly using state consumption. β_U is interpreted as amount of uninsured risk and is defined as $\beta_U = \beta_{U0} + \beta_{U1}\mathbf{z}$, where $\mathbf{z}$ contains chosen aggregate variables. $IS_k^{1d,2d}$ are 1- or 2-digit specializalion indices, that are defined in the data appendix. $\mu_k^1 = \frac{1}{T}\sum_{t=1964}^{1998}(Shapi_{t,k})$ and $\mu_k^2 = \frac{1}{T}\sum_{t=1973}^{1998}(SBE_{t,k}).\alpha^{\cdot}$ are not reported.The data are annual from 1963 to 1998. T-statisticis are in parenthesis. Significance at the10% level is denoted by a *, and at the 5% level by **

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
β_{0U}	0.36**	0.34**	0.40**	0.28**	0.42**	0.42**	0.43**	0.42**	0.42**	0.46**	0.46**	0.46**
	(8.46)	(6.78)	(11.17)	(5.63)	(10.50)	(7.58)	(11.51)	(11.39)	(7.51)	(11.06)	(10.97)	(10.94)
Δgdp_t	4.22*	4.89**	13.61**	1.10	14.94**	-2.58	2.63**	18.27**	2.96	16.62**	1.52	16.28**
	(1.95)	(2.24)	(2.06)	(0.16)	(2.29)	(-0.83)	(1.13)	(2.67)	(0.43)	(2.70)	(0.59)	(2.62)
$\Delta gdp_t{\cdot}\mu_t^1$	-82.75**	-85.95**				-62.01**	-79.64**				-79.81**	
	(-4.88)	(-4.94)				(-3.31)	(-3.97)				(-3.92)	
$\Delta gdp_t{\cdot}\mu_t^2$			-32.33**	-9.17	-34.85**			-43.04**	-23.17**	-42.86**		-41.58**
			(-2.85)	(-0.87)	(-3.10)			(-3.49)	(-2.15)	(-4.03)		(-3.85)
IS_k^{1d}	-0.02**		-0.03**				-0.03**	-0.03**				
	(-4.24)		(-2.55)				(-2.91)	(-2.90)				
IS_k^{2d}		-0.01**		-0.005	-0.01**	-0.01**			-0.01**	-0.02**	-0.02**	-0.02**
		(-2.83)		(-1.64)	(-2.86)	(-3.98)			(-3.94)	(-3.74)	(-3.71)	(3.74)
$\Delta gdp_t{\cdot}IS_k^{1d}$								0.69				
								(1.68)				
$\Delta gdp_t{\cdot}IS_k^{2d}$						0.38**	0.18		0.58**	0.45**	0.21	0.41**
						(3.34)	(0.49)		(5.35)	(2.84)	(1.34)	(2.60)
Trend	no	no	no	no	no	no	no	no	no	no	yes	yes
Method	0LS	0LS	WLS	OLS	WLS	OLS	WLS	WLS	OLS	WLS	WLS	WLS

Table 4: Risk Sharing, Banking Deregulation and the Business Cycle

Table reports results from the panel OLS regressions $\widetilde{gsp}_{k,t} - \widetilde{inc}_{k,t} = \alpha^I + \beta_I \widetilde{gsp}_{k,t} + \beta_d^I SDD_t^k + \epsilon_{k,t}^I,$

$$\widetilde{inc}_{k,t} - \widetilde{dinc}_{k,t} = \alpha^F + \beta_F \widetilde{gsp}_{k,t} + \beta_d^F SDD_t^k + \epsilon_{k,t}^F,$$
$$\widetilde{dinc}_{k,t} - \widetilde{c}_{k,t} = \alpha^C + \beta_C \widetilde{gsp}_{k,t} + \beta_d^C SDD_t^k + \epsilon_{k,t}^C,$$
$$\widetilde{c}_{k,t} = \alpha^U + \beta_U \widetilde{gsp}_{k,t} + \beta_d^U SDD_t^k + \epsilon_{k,t}^U.$$

$gsp_{k,t}$ is the growth rate of gross state product in state k in period t and $\widetilde{gsp}_{k,t}$is $gsp_{k,t}$ minus US-wide value of $gspUS_t$. $inc_{k,t}$ and $\widetilde{inc}_{k,t}$, $dinc_{k,t}$ and$\widetilde{dinc}_{k,t}$, $c_{k,t}$ and $\widetilde{c}_{k,t}$ are defined similarly using state income, disposable state income and consumption respectively. $\beta_{\cdot}$ are interpreted as amount of income smoothing, federal smoothing, consumption smoothing and the amount not smoothed and are defined as follows. $\cdot$ stays for I, F, C, U. SDD_t^k is intrastate deregulation dummy, it becomes 1 from the year of the k's state intrastate deregulation. $\alpha^{\cdot}$, $\beta_d^{\cdot}$ are not reported. The data is annual from 1963 to 1998. T-statistics are in parenthesis. Significance at the 10% level is denoted by a *, and at the 5% level by **.

	(I)	(F)	(C)	(U)
Panel A: $\beta_{\cdot} = \beta_{0\cdot} + \beta_{1\cdot} SDD_t^k + \beta_{2\cdot}\Delta gdp_t$				
$\beta_{0\cdot}$	0.4607**	0.0756**	0.2600**	0.2037**
	(25.3404)	(4.9552)	(5.6681)	(4.8316)
$\beta_{1\cdot}$	0.1952**	-0.0727**	-0.1403**	0.0177
	(8.8712)	(-3.9316)	(-2.5261)	(0.3463)
$\beta_{2\cdot}$	-3.0152**	0.9573**	6.2243**	-4.1664**
	(-7.5839)	(2.8673)	(6.2057)	(-4.5189)
Panel B: $\beta_{\cdot} = \beta_{0\cdot} + \beta_{1\cdot}\Delta gdp_t + \beta_{2\cdot}\Delta gdp_t SDD_t^k$				
$\beta_{0\cdot}$	0.5801**	0.0311**	0.1746**	0.2142**
	(47.4552)	(3.0275)	(5.7245)	(7.6073)
$\beta_{1\cdot}$	-6.0512**	1.1847**	11.0141**	-6.1475**
	(-11.4427)	(2.6698)	(8.3460)	(-5.0463)
$\beta_{2\cdot}$	5.4644**	-0.2079	-9.2033**	3.9467**
	(7.7511)	(-0.3514)	(-5.2312)	(2.4302)

Table 5: Risk Sharing, Banking Deregulation and Proprietary Income

Table reports results from the panel OLS regressions

$$\widetilde{gsp}_{k,t} - \widetilde{inc}_{k,t} = \alpha^I + \beta_I \widetilde{gsp}_{k,t} + \beta_d^I SDD_t^k + \tau_t^I + \theta_k^I + \epsilon_{k,t}^I,$$
$$\widetilde{inc}_{k,t} - \widetilde{dinc}_{k,t} = \alpha^F + \beta_F \widetilde{gsp}_{k,t} + \beta_d^F SDD_t^k + \tau_t^F + \theta_k^F + \epsilon_{k,t}^F,$$
$$\widetilde{dinc}_{k,t} - \widetilde{c}_{k,t} = \alpha^C + \beta_C \widetilde{gsp}_{k,t} + \beta_d^C SDD_t^k + \tau_t^C + \theta_k^C + \epsilon_{k,t}^C,$$
$$\widetilde{c}_{k,t} = \alpha^U + \beta_U \widetilde{gsp}_{k,t} + \beta_d^U SDD_t^k + \tau_t^U + \theta_k^U + \epsilon_{k,t}^U.$$

$\widetilde{gsp}_{k,t}$, $\widetilde{inc}_{k,t}$, $\widetilde{dinc}_{k,t}$, and $\widetilde{c}_{k,t}$ are defined in the text. $\beta_\cdot$ are defined as $\beta_\cdot = \beta_{0\cdot} + \beta_{1\cdot} gdp_t + \beta_{2\cdot} gdp_t \cdot \mu_k (1 - SDD_t^k) + \beta_{3\cdot} SDD_t^k$. $\cdot$ stays for I, F, C, U. μ_k denotes time-series means of the share of proprietary income or small business employment for every state k and is defined respectively as $\mu_k^1 = \frac{1}{T}\sum_{t=1964}^{1998}(Shapi_{t,k})$ and $\mu_k^2 = \frac{1}{T}\sum_{t=1973}^{1998}(SBE_{t,k})$. SDD_k is intrastate deregulation dummy, it becomes 1 from the year of the k's state intrastate deregulation. $\alpha^\cdot$ are not reported.The data is annual from 1963 to 1998. T-statistics are in parenthesis. Significance at the 10% level is denoted by a *, and at the 5% level by **.

	(I)	(F)	(C)	(U)
Panel A: $\beta_\cdot = \beta_{0\cdot} + \beta_{1\cdot} gdp_t + \beta_{2\cdot} gdp_t \cdot \mu_k^1 (1 - SDD_t^k) + \beta_{3\cdot} SDD_t^k$				
$\beta_{0\cdot}$	0.5103**	0.0846**	0.1383**	0.2668**
	(26.0876)	(5.0963)	(2.8010)	(5.8339)
$\beta_{1\cdot}$	-0.9138*	1.3380**	1.0698	-1.4941
	(-1.7878)	(3.0834)	(0.8291)	(-1.2504)
$\beta_{2\cdot}$	-34.5781**	-6.2651	84.8153**	-43.9721**
	(-6.4335)	(-1.3730)	(6.2513)	(-3.4996)
$\beta_{3\cdot}$	0.1202**	-0.0862**	0.0437	-0.0777
	(4.8706)	(-4.1149)	(0.7011)	(-1.3462)
Panel B: $\beta_\cdot = \beta_{0\cdot} + \beta_{1\cdot} gdp_t + \beta_{2\cdot} gdp_t \cdot \mu_k^2 (1 - SDD_t^k) + \beta_{3\cdot} SDD_t^k$				
$\beta_{0\cdot}$	0.4954**	0.0856**	0.1737**	0.2453**
	(25.4534)	(5.2090)	(3.5359)	(5.4080)
$\beta_{1\cdot}$	-1.2293**	1.4701**	1.7896	-2.0304
	(-2.2652)	(3.2076)	(1.3068)	(-1.6057)
$\beta_{2\cdot}$	-5.7200**	-1.6425	14.2039**	-6.8414**
	(-4.8008)	(-1.6324)	(4.7245)	(-2.4644)
$\beta_{3\cdot}$	0.1389**	-0.0888**	-0.0004	-0.0497
	(5.5959)	(-4.2378)	(-0.0058)	(-0.8594)

Table 6: Risk Sharing, Intra- and Interstate Banking Deregulation

Table reports results from the panel OLS regressions

$$\widetilde{gsp}_{k,t} - \widetilde{inc}_{k,t} = \alpha^I + \beta_I \widetilde{gsp}_{k,t} + \beta_d^I SDD_t^k + \tau_t^I + \theta_k^I + \epsilon_{k,t}^I,$$
$$\widetilde{inc}_{k,t} - \widetilde{dinc}_{k,t} = \alpha^F + \beta_F \widetilde{gsp}_{k,t} + \beta_d^F SDD_t^k + \tau_t^F + \theta_k^F + \epsilon_{k,t}^F,$$
$$\widetilde{dinc}_{k,t} - \widetilde{c}_{k,t} = \alpha^C + \beta_C \widetilde{gsp}_{k,t} + \beta_d^C SDD_t^k + \tau_t^C + \theta_k^C + \epsilon_{k,t}^C,$$
$$\widetilde{c}_{k,t} = \alpha^U + \beta_U \widetilde{gsp}_{k,t} + \beta_d^U SDD_t^k + \tau_t^U + \theta_k^U + \epsilon_{k,t}^U.$$

$\widetilde{gsp}_{k,t}$, $\widetilde{inc}_{k,t}$, $\widetilde{dinc}_{k,t}$, and $\widetilde{c}_{k,t}$ are defined in the text. $\beta_{\cdot}$ are defined as follows. $\cdot$ stays for I, F, C, U. $SDD_{k,t}^1$ and $SDD_{k,t}^2$ denote intra- and interstate deregulation respectively. $\alpha^{\cdot}$, $\beta_d^{\cdot}$ are not reported. The data are annual from 1963 to 1998. T-statistics are in parenthesis. Significance at the 10% level is denoted by a *, and at the 5% level by **

	(I)	(F)	(C)	(U)	(I)	(F)	(C)	(U)
	$SDD_{k,t} = SDD_{k,t}^1$, Intrastate Deregulation				$SDD_{k,t} = SDD_{k,t}^2$, Interstate Deregulation			
	$\beta_{\cdot} = \beta_{0\cdot} + \beta_{1\cdot} gdp_t + \beta_{2\cdot} gdp_t \cdot SDD_{k,t} + \beta_{3\cdot} SDD_{k,t}$							
$\beta_{0\cdot}$	0.49**	0.09**	0.18**	0.25**	0.51**	0.03**	0.28**	0.19**
	(25.18)	(5.24)	(3.62)	(5.45)	(36.58)	(2.40)	(7.86)	(5.83)
$\beta_{1\cdot}$	-4.71**	0.37	10.97**	-6.63**	-3.55**	1.11**	6.63**	-4.18**
	(-8.24)	(0.76)	(7.62)	(-4.99)	(-8.55)	(3.12)	(6.30)	(-4.29)
$\beta_{2\cdot}$	3.25**	1.14*	-9.13**	4.74**	0.12	-0.27	1.01	-0.85
	(4.10)	(1.71)	(-4.57)	(2.57)	(0.09)	(-0.26)	(0.32)	(-0.29)
$\beta_{3\cdot}$	0.15**	-0.09**	-0.01	-0.05	0.26**	0.01	-0.37**	0.10
	(5.92)	(-4.27)	(-0.08)	(-0.91)	(8.43)	(0.45)	(-4.77)	(1.39)

$$\beta_{\cdot} = \beta_{0\cdot} + \beta_{1\cdot} gdp_t + \beta_{2\cdot} gdp_t \cdot D_{k,t}^2 + \beta_{3\cdot} gdp_t \cdot D_{k,t}^1 + \beta_{4\cdot} D_{k,t}^2 + \beta_{5\cdot} D_{k,t}^1$$

	(I)	(F)	(C)	(U)
$\beta_{0\cdot}$	0.48**	0.08**	0.19**	0.24**
	(25.23)	(5.13)	(3.85)	(5.39)
$\beta_{1\cdot}$	-4.72**	0.36	10.97**	-6.61**
	(-8.38)	(0.76)	(7.67)	(-4.98)
$\beta_{2\cdot}$	-1.57	-0.69	5.71*	-3.46
	(-1.20)	(-0.61)	(1.72)	(-1.12)
$\beta_{3\cdot}$	3.05**	1.12	-9.37**	5.20**
	(3.68)	(1.58)	(-4.46)	(2.66)
$\beta_{4\cdot}$	0.22**	0.07**	-0.43**	0.14*
	(6.69)	(2.36)	(-5.11)	(1.81)
$\beta_{5\cdot}$	0.06**	-0.11**	0.15**	-0.10
	(2.25)	(-4.94)	(2.19)	(-1.52)

Table 7: Risk Sharing, Small businesses and Housing Collateral

Table reports results from the panel OLS regressions $\widetilde{gsp}_{k,t} - \widetilde{inc}_{k,t} = \alpha^I + \beta_I \widetilde{gsp}_{k,t} + \epsilon^I_{k,t}$, $\widetilde{inc}_{k,t} - \widetilde{dinc}_{k,t} = \alpha^F + \beta_F \widetilde{gsp}_{k,t} + \epsilon^F_{k,t}$, $\widetilde{dinc}_{k,t} - \widetilde{c}_{k,t} = \alpha^C + \beta_C \widetilde{gsp}_{k,t} + \epsilon^C_{k,t}$, $\widetilde{c}_{k,t} = \alpha^U + \beta_U \widetilde{gsp}_{k,t} + \epsilon^U_{k,t}$. $gsp_{k,t}$ is the growth rate of gross state product in state k in period t and $\widetilde{gsp}_{k,t}$is $gsp_{k,t}$ minus US-wide value of.$gspUS_t$. $inc_{k,t}$ and $\widetilde{inc}_{k,t}$, $dinc_{k,t}$ and $\widetilde{dinc}_{k,t}$, $c_{k,t}$ and $\widetilde{c}_{k,t}$are defined similarly using state income, disposable state income and consumption respectively. $\beta_{\cdot}$ are interpreted as amount of income smoothing, federal smoothing, consumption smoothing and the amount not smoothed and are defined as follows. $\cdot$ stays for I, F, C, U . Housing collateral ratio my is rescaled and measures collateral scarcity $(mys_t = \frac{my^{\max} - my_t}{my^{\max} - my_{\min}}, mys_t \in [0,1])$. The collateralmeasure is real estate wealth.The data is annual from 1963 to 1998. T-statistics are in parenthesis. Significance at the10% level is denoted by a *, and at the 5% level by **

	$(I\ )$	$(F\ )$	$(C\ )$	$(U\ )$
$\beta_{\cdot} = \beta_{0\cdot} + \beta_{1\cdot} gdp_t + \beta_{2\cdot} mys_t \cdot shapi^k_t + \beta_{3\cdot} mys_t + \beta_{4\cdot} shapi^k_t + \beta_{5\cdot}(t - \bar{t})$				
$\alpha^{\cdot}$	-0.0000	-0.0001	-0.0012	0.0014
	(-0.1239)	(-0.3343)	(-1.4332)	(1.7016)
$\beta_{0\cdot}$	0.5902**	0.1095**	-0.1475	0.4478**
	(12.4937)	(2.6654)	(-1.2167)	(3.9414)
$\beta_{1\cdot}$	-2.1758**	0.7118*	3.8192**	-2.3552**
	(-5.1324)	(1.9297)	(3.5107)	(-2.3099)
$\beta_{2\cdot}$	-3.9416**	0.1857	0.0837	3.6722*
	(-4.9746)	(0.2693)	(0.0412)	(1.9270)
$\beta_{3\cdot}$	0.3225**	-0.1752**	0.1696	-0.3168
	(3.5707)	(-2.2298)	(0.7316)	(-1.4586)
$\beta_{4\cdot}$	0.3211	0.0779**	2.2129**	-2.6118**
	(0.8570)	(0.2390)	(2.3016)	(-2.8985)
$\beta_{5\cdot}$	0.0103**	-0.0014	-0.0124**	0.0035
	(6.8022)	(-1.0508)	(-3.1939)	(0.9596)

Table 8: Risk Sharing and Asset Prices. Robustness check

Table reports results from the panel WLS/OLS regressions $\widetilde{c}_{k,t} = \alpha^U + \beta_U \widetilde{gsp}_{k,t} + \epsilon^U_{k,t}$. $gsp_{k,t}$ is the growth rate of gross state product in state k in period t and $\widetilde{gsp}_{k,t}$is $gsp_{k,t}$ minus US-wide value of $gspUS_t$. $c_{k,t}$ and $\widetilde{c}_{k,t}$ are defined similarly using state consumption. β_U is interpreted as amount of uninsured risk and is defined as $\beta_U = \beta_{U0} + \beta_{U1}\mathbf{z}$, where **z** contains chosen aggregate variables $\alpha^{\cdot}$ are not reported. cay_t is de-meaned consumption-wealth ratio. cay_t is deviation from cointegrating relationship between consumption, asset wealth and labor income. $CumD_t$ is defined as the fraction of states in the sample, which have deregulated. The data are annual from 1963 to 1998. T-statistics are in parentheses. Significance at the10% level is denoted by a *, and at the 5% level by **

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
$\beta_{0\cdot}$	0.34**	0.30**	0.33**	0.32**	0.32**	0.1837	0.30	0.18*
	(11.64)	(11.68)	(11.37)	(10.77)	(10.54)	(6.34)	(9.92)	(6.13)
gdp_t	-3.16**		-2.61**	-2.47**	-2.90**	-4.18**	-3.21**	-4.27**
	(-3.31)		(-2.69)	(-2.54)	(-2.87)	(-4.32)	(-3.18)	(-4.39)
cay_t		9.54**	8.22**	15.66**	8.84**	10.02**	1.52	8.81**
		(3.59)	(3.10)	(2.72)	(3.32)	(4.15)	(0.48)	(3.15)
$gdp_t \cdot cay_t$				-194.54				
				(-1.46)				
$gdp_t \cdot CumD_t$					3.67	10.77**	8.10**	12.16**
					(1.21)	(3.61)	(2.54)	(3.58)
$cay_t \cdot CumD_t$							26.98**	5.65
							(4.11)	(0.86)
Method	WLS	WLS	WLS	WLS	WLS	OLS	WLS	OLS

Table A1: Importance of small businesses across U.S. states

	Low		Middle		High	
	$Shapi_k$	SBE_k	$Shapi_k$	SBE_k	$Shapi_k$	SBE_k
1	Maryland	D.of Columbia	New York	Missouri	California	West Virginia
2	Rhode Island	Nevada	Alabama	Georgia	Colorado	Iowa
3	Virginia	Massachusetts	Pennsylvania	Wisconsin	Oregon	Nebraska
4	Michigan	Connecticut	Georgia	Alabama	Kentucky	Kansas
5	New Jersey	Delaware	Utah	Rhode Island	Vermont	Washington
6	West Virginia	New York	Illinois	Virginia	Mississippi	Florida
7	Ohio	Pennsylvania	Wisconsin	Mississippi	Texas	Oklahoma
8	Massachusetts	Illinois	Alaska	Arkansas	Wyoming	Hawaii
9	Connecticut	S. Carolina	New Mexico	Texas	Oklahoma	Vermont
10	S. Carolina	N. Carolina	North Carolina	Kentucky	Kansas	Oregon
11	Hawaii	California	Louisiana	Utah	Arkansas	Idaho
12	Delaware	Ohio	Missouri	Maryland	Montana	Alaska
13	Nevada	Tennessee	D. of Columbia	New Hampshire	Idaho	New Mexico
14	Florida	Michigan	Maine	Maine	Nebraska	South Dakota
15	Indiana	Indiana	Washington	Arizona	Iowa	North Dakota
16	Arizona	New Jersey	Tennessee	Louisiana	North Dakota	Wyoming
17	New Hampshire	Minnesota	Minnesota	Colorado	South Dakota	Montana